

# Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR) Guidance

## Operational Evaluation Levels (OELs), Operational Evaluations & the Operational Evaluation Report

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The Environmental Protection Agency (EPA) promulgated the Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR) in January 2006. The Stage 2 DBPR provides for increased protection against potential risks for cancer and reproductive and developmental health effects associated with Disinfection Byproducts (DBPs). The Stage 2 DBPR establishes maximum contaminant level goals for chloroform, monochloroacetic acid and trichloroacetic acid; maximum contaminant levels (MCLs), based on a locational running annual average (LRAA), for total Trihalomethanes (TTHM) and Haloacetic acids (HAA5); monitoring, reporting, and public notification requirements based on the TTHM and HAA5 MCLs; and revisions to the reduced monitoring requirements for bromate. The complete Stage 2 DBPR can be found at:

<http://www.epa.gov/safewater/disinfection/stage2/regulations.html>.

The Stage 2 DBPR also establishes operational evaluation requirements that are initiated by the TTHM and HAA5 levels found during Stage 2 DBPR compliance monitoring. Compliance with Stage 2 DBPR MCLs is based on the average of four individual quarterly DBP measurements collected at a given location (i.e., LRAA). However, a system that is in compliance with the Stage 2 DBPR MCLs, based on the LRAA, at a location may still have individual (i.e., not averaged) DBP measurements at that location that exceed the Stage 2 DBPR MCLs. EPA and the Stage 2 Microbial/Disinfection Byproducts (M/DBP) Advisory Committee were concerned about these higher levels of DBPs. The Stage 2 DBPR operational evaluation requirements were established to address this concern. **The operational evaluation requirements of the Stage 2 DBPR are intended as an indicator of operational performance and to better position systems to take proactive steps to remain in compliance with the Stage 2 DBPR MCLs. This early warning allows system operators to take steps to prevent the violation.**

### What is an Operational Evaluation Level?

The Stage 2 DBPR requires systems to conduct operational evaluations, initiated by operational evaluation levels (OELs) calculated using Stage 2 DBPR compliance monitoring data. An OEL is determined using a simple algorithm and, requires submittal of an operational evaluation report to the Vermont Drinking Water & Groundwater Protection Division if MCL values are exceeded.

### Calculating Operational Evaluation Levels (and determining if there is an OEL exceedance)

The formula below can be used to determine your OEL:

*For both TTHM and HAA5 and for each compliance monitoring location, calculate the following:*

$$[A + B + (2 * C)] / 4 = D$$

Where:

A = TTHM or HAA5 result for the quarter before the previous quarter (mg/L)

B = TTHM or HAA5 result for the previous quarter (mg/L)

C = TTHM or HAA5 result for the current quarter (mg/L)

D = your **Operational Evaluation Value (in mg/L)**

- If **D for TTHM** is > **0.080 mg/L**, you have an **OEL Exceedance**
- If **D for HAA5** is > **0.060 mg/L**, you have an **OEL Exceedance**

The OEL must be calculated at each location by the system operator (or other authorized system representative) once sample results are received from the lab. The results for the quarter (designated month) are averaged together before being used in the OEL calculation).

## Operational Evaluation Level Worksheets

The following worksheets can be used to help you organize your TTHM and HAA5 results and to determine your operational evaluation levels. **(NOTE: A self-calculating spreadsheet is embedded below and posted on the Division's Website at:**

<http://www.vermontdrinkingwater.org/pcswsqdbp.htm>

TTHM Data	Results from 2 Quarters Ago	Results from Last Quarter	Results from Current Quarter	Operational Evaluation Level	Need to conduct evaluation? (Yes if D > 0.080 mg/L)
Stage 2 Sample Site (Sample Point ID & Location)	A	B	C	$D = \frac{A + B + (2 * C)}{4}$	Yes OR No
(TH001)					
(TH002)					
(TH003)					
(TH004)					
(TH005)					
(TH006)					
(TH007)					
(TH008)					
(TH009)					

HAA5 Data	Results from 2 Quarters Ago	Results from Last Quarter	Results from Current Quarter	Operational Evaluation Level	Need to conduct evaluation? (Yes if D > 0.060 mg/L)
Stage 2 Sample Site (Sample Point ID & Location)	A	B	C	$D = \frac{A + B + (2 * C)}{4}$	Yes OR No
(HA001)					
(HA002)					
(HA003)					
(HA004)					
(HA005)					
(HA006)					
(HA007)					
(HA008)					
(HA009)					

A fully functional spreadsheet for calculating OEL values is embedded, below:

TTHM	Column1	Column2	Column3	Column4
TTHM Sample Point ID	Quarter Before Previous Quarter	Previous Quarter	Most Recent Quarter	OEL Calculation
TH001				0
TH002				0
TH003				0
TH004				0
TH005				0
TH006				0
TH007				0
TH008				0
TH009				0

HAA5	Column1	Column2	Column3	Column4
HAA5 Sample Point ID	Quarter Before Previous Quarter	Previous Quarter	Most Recent Quarter	OEL Calculation
HA001				0
HA002				0
HA003				0
HA004				0
HA005				0
HA006				0
HA007				0
HA008				0
HA009				0

The first determination of OELs occurs after the completion of your first three quarterly monitoring periods. Thereafter, the determination of OELs is completed each quarter when new monitoring results become available.

## What Are the Requirements If the Operational Evaluation Level is Exceeded?

If the OEL is exceeded, you **must** take the following actions (40 CFR 141.626(b)):

1. **Notify the Vermont Drinking Water & Groundwater Protection Division within 10 days of the end of quarter in which the OEL was exceeded.**

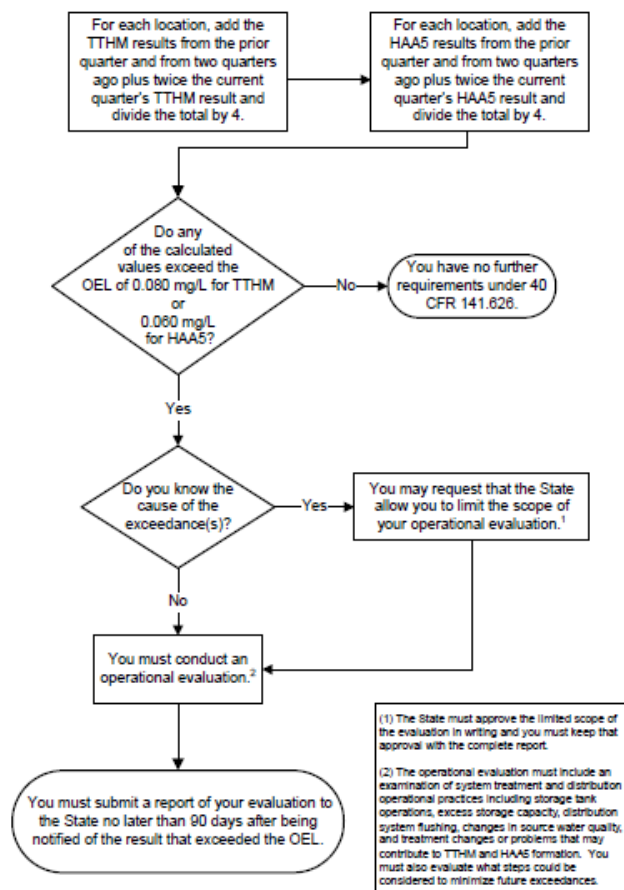
The Division will need the following information reported:

- Monitoring location(s) where the OEL exceedance occurred
- Date notified of sample result(s) causing the exceedance
- Calculated OEL(s)

2. **Conduct an operational evaluation to identify the cause of the exceedance. Submit a report to the Vermont Drinking Water & Groundwater Protection Division within 90 days after being notified by the lab of the sample result that caused the exceedance (not the end of the quarter).**
3. **Maintain a copy of the operational evaluation report to be made available to the public upon request (for no fewer than 10 years).**

*An OEL exceedance is not a violation of the Stage 2 DBPR. However, failure to submit an evaluation report to the State in the required time frame is a violation and requires Tier 3 public notice (as required by the Public Notification Rule). All Stage 2 DBPR compliance monitoring results must be included in the system's Consumer Confidence Report (CCR). There are no additional CCR requirements related to an OEL exceedance unless the system is in violation due to failure to complete and submit an OEL report.*

Exhibit 1.1 Operational Evaluation Flow Chart (40 CFR 141.626)



## When Do the Operational Evaluation Requirements Take Effect?

The operational evaluation provision of the Stage 2 DBPR applies to compliance monitoring results. The first determination of OELs would be after the completion of your first three quarterly monitoring periods. Thereafter, the determination of OELs would be completed each quarter when new monitoring results are available. The schedule for Stage 2 compliance monitoring is summarized in the table below:

If your system serves:	Begin Stage 2 DBP Compliance Monitoring by:
At least 100,000 people or part of a combined distribution system serving at least 100,000 people (Schedule 1 Systems)	April 1, 2012
50,000 – 99,999 people or part of a combined distribution system serving 50,000 – 99,999 people (Schedule 2 Systems)	October 1, 2012
10,000 – 49,999 people or part of a combined distribution system serving 10,000 – 49,999 (Schedule 3 Systems)	October 1, 2013
Fewer than 10,000 people or part of a combined distribution system serving fewer than 10,000 people (Schedule 4 Systems)	October 1, 2013 for systems NOT conducting <b>Cryptosporidium</b> monitoring under 40 CFR 141.701(a)(4). October 1, 2014 for systems conducting <b>Cryptosporidium</b> monitoring. (NOTE: For most Vermont Schedule 4 systems DBP monitoring begins August 2014)

## Operational Evaluations

If your operational evaluation levels are higher than the MCL at any location in the distribution system, you must conduct an operational evaluation. Your operational evaluation must include:

- An examination of system treatment and distribution operational practices, including:
  - Storage tank operations
  - Excess storage capacity
  - Distribution system flushing
  - Changes in sources or source water quality
  - Treatment changes
  - Any problems that may contribute to TTHM and HAA5 formation
- What steps could be considered to minimize future exceedances.

*An OEL exceedance requires an operational evaluation meeting specific criteria and reporting of the evaluation to the State, but **does not require systems to take corrective actions**. The operational evaluation and report will provide valuable information to both the system and the State regarding strategies the system could use to avoid an MCL exceedance.*

## Limited Scope Operational Evaluation & Report

If the system can determine the cause of the OEL exceedance to the Vermont Drinking Water & Groundwater Protection Division's satisfaction, the system may request that the Division allow a limited scope operational evaluation. The Division must then approve the limited scope of the evaluation in writing and the system must keep the written approval with the completed report.

Examples where the cause of the OEL exceedance may be known include the following:

- Total organic carbon (TOC) source water and finished water data indicate poor TOC removal across the plant.
- Source water and finished water data indicate a sudden increase in temperature.
- Plant flows were reduced due to lower demand, resulting in a much longer contact time between the chlorine and DBP precursors.
- Predisinfection chlorine feed rates were unusually high.
- OEL exceedance occurs at same location as previous monitoring period for which a cause has been identified but the solution has not yet been implemented.

**Note that submitting this request WILL NOT extend the 90 day deadline for submitting the operational evaluation report.**

## Full Operational Evaluation & Report

The Vermont Drinking Water & Groundwater Protection Division has prepared a Guidance Sheet/Interactive Form that can be downloaded from the Division's Website at the following Internet address:

<http://www.vermontdrinkingwater.org/pcwswqdbp.htm>

The document provides guidance on how to complete the Operational Evaluation and draft the OEL Report. It includes checklists for conducting:

- A source water evaluation
- A treatment process evaluation
- A distribution system evaluation

Once downloaded to your computer, you can complete necessary information regarding your water system, document important factors that could have contributed to elevated DBP levels, consider relevant data, explore possible remedies, and complete an OEL Report for submission to the Vermont Drinking Water & Groundwater Protection Division for review and approval.

At the Division's Website, you can also find checklists prepared by the U.S. EPA. These checklists can be useful to you in conducting the various evaluations and in efforts to identify likely cause(s) of the elevated DBP level(s). At the Website you can also find documents describing Best Management Practices (BMPs) for DBP minimization. Quick links to these are included below as well...

### Best Management Practices (BMPs) for DBP Minimization:

- [Practical Treatment Processes & Techniques for Controlling & Lowering DBPs](#)
- [BMPs for the Control of Disinfection By-Products](#)
- [Best Management Practices for the Control of Disinfection by-Products in Drinking Water Systems in Newfoundland and Labrador](#)
- [Expanded Decision Making Framework for Selecting DBP Corrective Measures](#)
- [System Optimization Coagulant Study Leads to Improved Treatment](#)
- [Chemistry and Treatment of Disinfection Byproducts in Drinking Water](#)
- [Distribution System Cleaning / Uni-Directional Flushing](#)

A comprehensive (180 page) Operational Evaluation Guidance Manual prepared by the U.S. EPA is also available for viewing and/or download at the Division Website at the address previously listed (or by clicking on the live link, below):

- [U.S. EPA Operational Evaluation Guidance Manual](#)

Section 6 of the EPA guidance is called "Minimizing Future Operational Level Exceedances".

#### (FROM OEL GUIDANCE) Exhibit 6.1 Examples of Operational Strategies to Reduce DBPs

- Turn over water in finished water tanks and reservoirs more frequently to reduce water age. (6.1.1.1)
- Use blowoffs or flush dead ends in the distribution system to reduce water age. (6.1.1.2)
- Conduct periodic flushing. (6.1.2.2)
- Increase TOC removal by optimizing coagulation. (6.2.1.1)
- Clean settling basins before your peak DBP period. (6.2.1.3)
- Optimize filtration. (6.2.1.4)
- Review disinfection practices. Note that you MUST contact your State first before making any changes to disinfection practices. (6.2.3)
- Monitor source water and manage intake operations to draw raw water with the lowest possible TOC. (6.3)

## Consecutive Systems

If yours is a consecutive system and you purchase all of your water, the operational evaluation will likely focus on the distribution system – but should not be limited to this. The Division encourages working collaboratively with the parent system to explore possible reasons for the OEL exceedance beyond the control of the consecutive system.

- Consecutive systems should consider collecting TTHM and HAA5 data at the wholesale connection point (e.g., master meter, intertie, turnout, etc.). Knowledge of the concentration of these DBPs at the entry point to the system will help assess how they change (i.e., increase or decrease) within the system.

Additional guidance specifically developed for those responsible for consecutive systems can be found on the Division's Website or by clicking on the live links, below:

- [Stage 2 Disinfectants and Disinfection Byproducts Rule Consecutive Systems Guidance Manual](#)
- [DBP Control Strategies for Consecutive Systems and other Problem Areas in Distribution Systems](#)

## Compliance

Again, **An OEL exceedance is not a violation of the Stage 2 DBP Rule.** However, **failure to report the OEL exceedance or failure to submit an evaluation report to the State in the required time frames are violations and require Tier 3 public notice** (as required by the Public Notification Rule).

## Key Points to Remember

- The OEL is to be calculated by any system on quarterly monitoring under the Stage 2 DBPR
- If the OEL exceeds MCL:
  - Notify the Vermont Drinking Water & Groundwater Protection Division within 10 days from the end of the quarter in which the exceedance occurred.
  - Conduct an Operational Evaluation and submit the OEL Report to the Vermont Drinking Water & Groundwater Protection Division within 90 days of being notified by the lab of the high result.
- Use Division and U.S. EPA checklists and guidance manuals to help evaluate why the exceedance occurred. The checklists and associated attachments are critical components of the OEL Report.

***The following pages include important supplemental information regarding compliance with the Stage 2 DBPR.***

## How are Stage 2 Compliance and MCL Violations Determined?

Compliance with the TTHM and HAA5 MCLs for Stage 2 DBPR is based on your monitoring results at each monitoring location.

**If you monitor once per quarter:** (*quarterly means approximately every 90 days – during the month specified in the system's Monitoring Schedule*)

- Compliance is based on the LRAA of monitoring results, calculated.
- You must make compliance calculations beginning with the end of the fourth quarter of monitoring and continue calculations after each quarter.
- If you fail to complete four consecutive quarters of monitoring, you must calculate compliance with the MCL based on the average of the available data from the most recent four quarters.
- If you take more than one sample per quarter at a monitoring location, you must average all samples taken in the quarter at that location to determine a quarterly average to be used in the LRAA calculation.
- If the LRAA at any location exceeds the MCL, you are in violation.
- Failure to monitor will be treated as a monitoring violation for the entire period covered by a locational running annual average compliance calculation for the Stage 2 MCLs.

**If you monitor once per year:** (*during the month specified in the system's Monitoring Schedule*)

- Compliance is based on the value of the yearly samples at each location.
- You must make compliance calculations beginning with the first compliance sample taken after the compliance date.
- If any sample exceeds the MCL, you are not immediately in violation. You must begin increased monitoring immediately (monitor quarterly at each location).
- If any sample exceeds the MCL and you are on reduced monitoring, you must begin increased monitoring immediately (monitor quarterly at each location).
- Failure to monitor will be treated as a monitoring violation for the entire period covered by a locational running annual average compliance calculation for the Stage 2 MCLs.

The table below summarizes the TTHM and HAA5 compliance requirements:

TTHM and HAA5 compliance	Quarterly monitoring	Once per year or less frequent monitoring
Is based on	LRAA—calculated quarterly for each sampling location	Value of yearly or less frequent samples at each sampling location
If LRAA exceeds the MCL	Violation if any sampling point exceeds the LRAA*	Not immediately in violation; start quarterly monitoring to determine compliance

*\* Compliance is based on the LRAA so if any one sample exceeds an annual average (e.g. over 4 x the MCL) or any combination of samples in the four quarters exceeds the MCL; the system is in violation of the MCL.*

### Tier 2 Public Notice Requirements:

MCL violations are Tier 2 violations (requiring Tier 2 Public Notice) because TTHMs/HAA5s are considered chronic contaminants. THUS, an MCL exceedance under the Stage 2 Disinfectants & Disinfection Byproducts Rule requires systems to:

- Issue a notice (that meets all 10 content elements) within 30 days using appropriate delivery methods.
- Submit to the Vermont Drinking Water & Groundwater Protection Division a copy of the Public Notice and the Certification of Delivery form within 10 days of the date Public Notice was issued.
- Repeat Public Notice every 90 days for as long as the violation persists.

*Repeat Public Notice as often the same as the new Public Notice that is required each quarter the system incurs a violation. It is rare that a system incurs a violation that is unresolved long enough to require repeat Public Notice before the next quarter's violation occurs.*

## CCR Requirements:

The Consumer Confidence Report (CCR) Rule requires systems to report in their annual consumer confidence reports any regulated contaminants that are detected. Since detection is not defined for DBP contaminants, the Stage 2 DBPR specifies reporting levels for the regulated DBPs. EPA has incorporated minimum reporting level (MRL) requirements into the laboratory certification program for DBPs and required systems to use regulatory MRLs as the minimum concentrations that must be reported as part of the CCRs.

When compliance with the MCL is determined by calculating an LRAA, systems must include the highest LRAA for TTHM and HAA5 and the range of individual sample results for all sampling points expressed in the same units as the MCL. If more than one site exceeds the MCL, the system must include the LRAA for all sites that exceed the MCL.

Under the CCR Rule, the wholesale system is responsible for notifying the consecutive system of analytical results and violations related to monitoring conducted by the wholesale system. Consecutive systems must include analytical results of the wholesale system in their CCR, unless the consecutive system conducted equivalent testing demonstrating that it was in compliance. In the latter case, the consecutive system must report its own compliance monitoring results.

## Reduced Monitoring

Your system can qualify for reduced monitoring if after four (4) consecutive quarters (or after posting a system's first annual result) you meet all three of the following criteria:

1. The LRAA is < 0.040 mg/L for TTHM at all (approved) monitoring locations,
2. The LRAA is < 0.030 mg/L for HAA5 at all (approved) monitoring locations, and
3. The source water annual average TOC level (before any treatment) is < 4.0 mg/L at each treatment plant treating surface water or ground water under the direct influence of surface water (Subpart H Systems must sample for TOC every 30 days to qualify for reduced monitoring and sample every 90 days to remain on reduced monitoring).

### Reduced monitoring requirements:

Source Water Type	Population Size Category	Reduced Monitoring Frequency	Distribution System Monitoring Location Per Monitoring Period
Subpart H (Surface Water)	<500	--	Monitoring may not be reduced.
	500 – 3,300	Annually/Yearly	One TTHM and One HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 measurement; one dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	3,301 – 9,999	Annually/Yearly	Two dual sample sets: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement.
Ground Water	<500	Triennially (Every Third Year)	One TTHM and One HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; one dual sample set if the highest TTHM and HAA5 measurements occurred at the same location and quarter.
	500 – 9,999	Annually/Yearly	One TTHM and one HAA5 sample: one at the location and during the quarter with the highest TTHM single measurement, one at the location and during the quarter with the highest HAA5 single measurement; one dual sample set per year if the highest TTHM and HAA5 measurements occurred at the same location and quarter

Systems may remain on reduced monitoring as long as their quarterly LRAAs for TTHMs and HAA5 remain no more than 0.040 mg/L and 0.030 mg/L, respectively (for systems with quarterly reduced monitoring) or their TTHM and HAA5 samples are no higher than 0.060 mg/L and 0.045 mg/L, respectively (for systems with annual or less frequent monitoring). In addition, Subpart H systems must continue to maintain annual average TOC levels of 4.0 mg/L or less in source water at each treatment plant (monitoring no less frequently than every 90 days).

## Reduced Monitoring for Systems Using Ozone

Systems that disinfect with ozone have been eligible for reduced monitoring under the Stage 1 DBP Rule if they demonstrate low levels of bromide. Sensitive analytical methods have become available for bromate. The Stage 2 rule specifies that systems using ozone and on reduced monitoring must begin in April 2009 to demonstrate a running annual average bromate concentration < 0.0025 mg/L in order to remain on reduced monitoring.

## Increased Monitoring

If you monitor yearly (or less frequently if on reduced monitoring), you must begin increased monitoring and sample every 90 days if:

- Any TTHM sample > 0.080 mg/L, or
- Any HAA5 sample is > 0.060 mg/L.

Note that this is not an immediate violation. However, your system is in violation of the Stage 2 MCLs if the TTHM or HAA5 LRAA exceeds the MCL after four quarters of sampling.

You may return to **routine monitoring** from increased monitoring when all of the following criteria are met:

- You have conducted increased monitoring for at least four quarters, and
- LRAA for **every** monitoring location is < 0.060 mg/L for TTHM, and
- LRAA for **every** monitoring location is < 0.045 mg/L for HAA5.